INFORMATION TECHNOLOGY TRENDS REPORT 1991

Ontario

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Information Technology Trends Report 1991

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Information Technology Trends Report 1991

INTRODUCTION

Since 1983, the Management Board of Cabinet has published comprehensive trends reports on information technology spending in the Ontario government. These reports are based on information reported by all ministries. They present an overview of expenditures on information technology personnel, systems consultants, computer hardware, and data communications. They also review the major information technology functions that incur these expenditures, such as systems planning and development, systems maintenance and operations, and end-user activities including personal computer utilization and office automation (e.g., using electronic mail).

This year's report presents an overview of trends in information technology spending throughout the Ontario government. In addition, it discusses some of the innovative projects that use information technology to improve the delivery of government programs.

The report has been prepared for government program managers and the providers of the government's information technology services so that they may compare their information technology environments with those in other ministries and the government as a whole. Private sector suppliers of information technology goods and services may also benefit from the aggregate and individual ministry statistics presented here.

Data collection

Data used in this report was collected from individual ministries in October 1990, and covers total information technology expenditures for the years 1987-88, 1988-89, and 1989-90, as well as projected expenditures for 1990-91. A detailed breakdown of information technology spending is presented only for the year 1989-90, the year upon which this report is based. Some comparative information is presented on individual ministries; however, it is not the purpose of this report to provide a detailed examination of trends at the ministry level but rather at the level of the Ontario government overall.

Although the types of information technology expenditures shown in this report remain largely the same as in the previous reports of 1985 and 1988, a few classifications have been revised to reflect the changing scope of various information technology functions. Where such reclassification occurs, historical data is presented in a new format that is consistent with the approach of this report.

The major supplier of computer services to ministries is the Computer and Telecommunication Services Division (CTS) of the Ministry of Government Services. In this report, ministry expenditures paid to CTS are treated as spending on information technology services. To avoid double-counting, CTS expenditures paid to the private sector are not included, unless the text explicitly states otherwise.

OVERVIEW: GENERAL TRENDS

Although the 1980s represent only the third decade since the birth of commercial information technology, the pace at which this technology has been integrated into everyday business life is remarkable. The government is quickly approaching the day when every employee who works with information will have access to a computer workstation.

Prior to 1980, information technology in the Ontario government was characterized for the most part by mainframe computer systems. Large transaction-processing systems were the norm, and the lion's share of information technology budgets was dedicated to the development and operation of these systems.

In the early years of the eighties decade, however, the economics of large-scale mainframe computing was challenged by the emergence of general-purpose minicomputers, often referred to as "departmental computers" for their ability to operate on a stand-alone basis in an office environment. Initially, minicomputer-based systems were implemented to meet specialized operational needs of particular ministries. But with the introduction of office-automation software, minicomputer systems became affordable and attractive to a broader range of users eager to short-cut mainframe system-development queues. In several ministries, these systems were acquired by the program areas themselves, and were largely independent of resources supplied by the ministry's central information technology organization. Expenditures on mainframe computers continued to grow, but the rate of this expenditure growth slowed down.

In the second half of the 1980s, there was a surge in demand for personal computers (PCs) as increasing competition led to falling prices. In 1985, there was one computer workstation (a PC or a terminal) for every 11.3 government employees. By 1987, there was one workstation for every 7.4 employees. In 1990, the ratio became one workstation for every 2.5 employees. Of the more than 35,000 computer workstations currently in use in the government, two out of every three are personal computers, and 70 percent of these have been acquired in the past two years. The remaining third of the government's workstations are terminals dedicated to either mainframes or minicomputers.

PCs have been used not only to support the automation of office functions such as wordprocessing and creating spreadsheets, but also to provide a new set of analytical tools for program managers. Operationally, PCs have been used to provide customized computer applications. PCs are also being used to replace terminals that have only a single function, such as accessing a mainframe system.

The challenge of the nineties is to maximize the value of technology as an enabler of service excellence in the delivery of government programs. It is no longer sufficient to merely automate or accelerate the business processes of the past. Instead, we must completely rethink our fundamental processes and approaches to business. The focus is now on implementing technology within a coherent framework to support well-defined business needs. Technology, coupled with an understanding of information as a strategic corporate resource, is a key tool allowing us to re-engineer the business of government.

RECENT DEVELOPMENTS

Information technology strategic planning

By the mid-eighties, new computer systems were being implemented in almost every ministry. Unfortunately, many of these new computer systems were developed in isolation. The systems were usually set up to solve a single operational problem for a particular unit of a particular ministry. Issues such as consistency with other technology initiatives throughout the government or employing the most appropriate technology to enhance the business of the ministry as a whole were not always addressed.

In 1988, the Management Board of Cabinet issued a directive requiring all ministries to develop an information technology strategic plan. The aim of the directive is to ensure that all technology is an integral part of an overall strategic business plan and coherent technology framework. To meet the requirements of the directive, an information technology strategic plan must:

- state the business goals and objectives of the ministry;
- define the information, applications and technology required to effect the business goals and plans;
- state the costs and benefits of the plan;
- include an action-oriented operational plan.

As of July 1991, twenty-one ministries have information technology strategic plans that have been approved by the Management Board. The development of these plans has required the involvement of many program managers, information technology users, and information technology providers. The process has sparked a greater awareness of the value of integrated forward planning and a corporate perspective for data management and data sharing. For some ministries, it has become a vehicle for rethinking approaches to service delivery and the operational use of information and automation. The Ministry of Health, for example, is establishing new directions and standards for health care as it implements its strategic plan. The ministry is using information technology to enable a shift toward more proactive management of the health-care system and to foster new directions such as more community rather than institutional care, and an increased focus on prevention rather than treatment of illness.

Information technology infrastructure

Many ministries are currently establishing information technology infrastructures to support their business needs. Facets of such an infrastructure include:

- telecommunication networks to support a wide range of data, voice, and image processing applications;
- comprehensive office-automation systems;
- corporate data architectures and data models;
- standards for the planning, development and implementation of information technology systems;
- standards for data security;
- management processes that ensure senior-executive participation.

Several ministries have centralized their information technology functions under a senior manager who is responsible for the planning, development and implementation of all application projects. Other ministries have adopted a decentralized approach, with information technology projects directly managed by the relevant program area. Those ministries that have adopted a decentralized approach may still maintain a Management Information Systems (MIS) department, but in such cases the MIS department sets standards and functions as a coach, facilitator and technology resource centre, in service to the program areas.

Emerging technology trends

Between 1987 and 1990 the following technological trends emerged throughout the Ontario government:

- relational database-management software is becoming more widely used to facilitate the growing need for flexible, ad-hoc access to data;

- automated application-development tools are becoming more common as an aid to enhancing the productivity and quality of development projects;
- local-area networks are becoming more widespread in order to increase the productivity of personal computers as a desktop tool;
- imaging technologies are being implemented by ministries as a means of controlling and providing concurrent remote access to large numbers of documents;
- Geographic Information Systems (GIS) technology is being implemented by several ministries as a strategic decision-support tool;
- voice-mail technology is being implemented in almost all ministries as a tool for improving communications and productivity;
- voice-response technology is emerging as a major tool for enhancing service delivery in those ministries that provide information by telephone.

Opportunities for new partnerships

As ministries develop their information technology plans, they are also discovering opportunities for data-sharing with other ministries, agencies and the private sector. Various cost-efficient, data-sharing approaches are being explored. For example, in early 1991, the Ministry of Consumer and Commercial Relations announced the formation of a "strategic alliance" between government and the private sector to provide value-added information services based on the provincial land-registry databases. This alliance is discussed in more detail on pages 5 and 6 of this report.

Business re-engineering

Business re-engineering is the most revolutionary kind of change an organization can contemplate. It is a people-based opportunity requiring strong leadership from the top and complete involvement by all levels of the organization. Business re-engineering is the complete rethinking of the organization's fundamental processes and approaches to business. It results in renewed organizational structures, and is dependent upon the organization's ability to learn and deploy new and advanced technologies.

The Ministry of Revenue is currently re-engineering its businesses. It hopes to create a more flexible, client-oriented organization that will foster excellent service and maximize the effectiveness of program delivery. Further details of this project are presented on pages 7 and 8 of this report.

MAJOR NEW INITIATIVES

The following is a sampling of innovative information technology initiatives that have been launched by various ministries over the past three to five years.

Land Related Information Systems

Land Related Information Systems (LRIS), and the Geographic Information Systems (GIS) they are built upon, allow for the analysis of data that can be linked to a point on the earth. A GIS provides geographic data in a digital form. The LRIS overlays nongeographic information, for example census data, to provide information about the piece of the world that is mapped by the GIS.

The LRIS/GIS concepts apply across a diverse set of disciplines, such as municipal administration, forestry, wildlife management, and urban planning. The LRIS/GIS facilitate better decision making by providing comprehensive information that displays both spatial and temporal relationships in a graphic form. Analysis of this data can ensure that schools are built where children reside, natural resources are harvested in a sustainable manner, and that dangerous goods are not transported through heavily populated or environmentally sensitive areas.

Geographic Information Systems

The Ministry of Natural Resources is a world leader in GIS. The ministry has been involved in GIS since the early 1970s, and is a major force in establishing and promoting standards throughout the international GIS community. The foundation of the ministry's GIS is the Ontario Base Mapping (OBM) program, and the ministry is committed to digitally map all of the populated and resource-development areas of the province by 1997. Once the base map is complete, different overlays as diverse as land-use and census data can then be projected onto it. This yields an integrated information system that is incorporated into GIS models for use in decision making.

The Ministry of Natural Resources now has two major GIS pilot projects—a model-district GIS project and a Forest Management Decision Support System (FMDSS) project. The goal of the model-district GIS project is to allow integrated resource management in a given area. The project is being piloted in Cambridge and Timmins Ontario. So far, the project has successfully modelled the impact on resource values of a proposed hydro corridor, and aided in compiling and analyzing tax-rebate applications for the Conservation Tax Reduction Program. The GIS has substantially reduced the time and effort that would normally have been required to complete these tasks. Meanwhile, the FMDSS project is aimed at improving the quality of the timber-management planning process in Ontario, a complex process which involves identifying and evaluating strategies for timber harvesting, regeneration and tending as well as access planning.

The LRIS strategic alliance with the private sector

On 15 February 1991 the Ministry of Consumer and Commercial Relations entered into a partnership with the private sector consortium Real/Data Ontario Inc. This partnership, referred to as a "strategic alliance," has a dual mandate: to implement the Province of Ontario Land Registration Information System (POLARIS) and to develop an internationally competitive land-information-systems industry.

The POLARIS is an automated property-title indexing and mapping system proven in Woodstock, London, Chatham and Toronto. The title index, organized on a property-ownership basis, can be searched on-line through reference to a property identification number, address, name of owner, or instrument number. The digital map base can display and provide a printout of survey fabric, property lines and the property identification number.

The strategic alliance will draw upon the unique capabilities of each of the public and private sector partners. The government brings to the partnership a proven system, a client base, equity and credibility in marketing. Real/Data Ontario Ltd. has technical expertise in surveying and computer systems, business acumen, further equity, marketing expertise

and a global network. The strategic alliance has a ten-year licence to access and distribute the POLARIS data. It will market Ontario expertise in Canada and the international marketplace.

The work of this partnership promises to be of tremendous benefit to industry, government and clients of the land-registry system. The widespread implementation of POLARIS will streamline operations at land-registration offices. Currently, land records for approximately 3.8 million properties are maintained in a paper format in 65 government offices. New services including remote access will be developed in response to market demand. Through system improvements and acquisition of data, the network should evolve into a utility that distributes data from a number of sources. Enhancements to the POLARIS functionality will support a wide range of GIS services: land-use planning, zoning and development, site planning, emergency-vehicle dispatch, resource-management applications and market analysis. POLARIS implementation will also serve as a catalyst that fosters development of expertise in GIS.

Imaging

The Ontario Registrar General has successfully implemented technology that is increasing service levels, transforming its workplace, and reorienting its focus from paper to clients.

The Ontario Registrar General maintains records of births, marriages, divorces, name changes, and deaths; compiles statistics; and produces copies of certificates. This data is contained in eighteen million records. These records occupy most of an entire floor of a large modern office building, and represent a vital resource to the province. In paper form they are constantly deteriorating, and at risk of damage or destruction from a catastrophe such as fire. Paper files are also bulky, and working with them is labour-intensive. Prior to 1991, it took an average of three days to get a copy of a certificate if the request was made in person, and up to three weeks if the request was mailed.

This institution is creating a flexible work environment and increasing service levels and security by employing an imaging system. The head office of the Ontario Registrar General has moved from Toronto to Thunder Bay, employees have been reorganized into teams, and part-time and flex-time work hours have been introduced. In partnership with Goodwill Industries, eleven million documents have been scanned into a database on optical discs. Now the records are secure, and can be replaced from backups if they are destroyed or damaged. Technology is to be implemented to enable remote access from authorized ministry locations throughout the province. The database will be searched electronically from a desktop terminal, and most requests will be handled on-line. Retrieving a document will take between five and twenty seconds. A copy of a document will be furnished immediately, or mailed out the same day.

Systems integration

Recently, the Ontario Development Corporations embarked on a renewal program to decentralize and computerize operations. In nearly twenty years of operating, the development corporations had not taken advantage of succeeding waves of change in office technologies, management techniques and organizational reform. By employing new technology, redefining responsibilities and integrating systems, the corporations have increased service levels, enriched jobs and are handling greater workloads.

The Ontario Development Corporations are Crown agencies of the Ministry of Industry Trade and Technology that have been established to encourage the development and diversification of industry and tourism in Ontario. The corporations provide financial assistance through loans, loan guarantees and equity to viable small businesses throughout Ontario.

The corporations' original structure consisted of three distinct units: loan evaluation, disbursements, and collections. Each unit operated independently, resulting in multiple lines of responsibility and poor customer service. The original computer

systems were not integrated and were mainly batch-oriented. Such systems could not handle cases that were the least bit unusual, and manual procedures became the norm as the business environment grew more complex and diverse. Communications among functional areas suffered and service levels degraded further.

Under the recent reorganization, the loan-application and administrative functions were decentralized from the Toronto head office to seventeen regional field offices throughout the province. The corporations' administrative staff were thus put into closer contact with the entrepreneurs of the communities they were serving. Regional directors were given increased responsibility for loan-approval thresholds and guarantees.

The new decentralized organization is supported by modern, integrated computer systems and redefined staff responsibilities. A customized loan accounting and administration system has been installed. This system supports both head and regional offices through a province-wide data-communications network. The management team has adopted a "one window" approach to client services. The organizational principle underlying all structural changes is that clients are no longer to be shuffled from section to section as they move through the lending process. Instead, clients continue to deal with the same business consultant originally assigned to their case.

The corporations now have a state-of-the-art technology base to better serve clients and handle increasing workloads. The key ingredients to the success of the renewal program have been management's commitment to change, and support from various key agencies.

Electronic access to public data

The Ministry of Consumer and Commercial Relations has installed a new automated system that allows direct public access to the Personal Property Security Registration System (PPSRS). The PPSRS records the existence of a secured loan against personal property. In this case, personal property means everything except buildings and land, but primarily refers to liens on cars. The system allows lenders to publicly establish a claim against a property, and also allows anyone interested in acquiring a property to check whether or not there is an outstanding claim against it.

Under the new system, members of the public may make routine enquiries themselves at terminals available at each of the ministry's forty-nine land-registry offices, or at the central office in Toronto. Terminals are also being placed directly in the offices of some major clients, such as banks and law offices. The next phase will be to introduce electronic registration directly from client sites.

The system handles about 2 million registrations and 1 million enquiries per year. Client access has greatly expanded, and service levels have increased. The number of enquiries handled has risen to more than 35,000 per day, and the time it takes to obtain an answer about a property has fallen to about three minutes, from an elapsed time of as much as several days under the old system.

Business re-engineering with ESPRIT

The Ministry of Revenue has embarked on a five-year, $38 million project that will revolutionize the way it does business. The project, known as ESPRIT (Enterprise Strategic Planning Revenue in Transition), is re-engineering the ministry's basic business procedures by implementing new information technology in support of major organizational change.

The Ministry of Revenue is responsible for collecting provincial taxes from 730,000 businesses, assessing the property values of over five million businesses and residences, and administering grants for over one million senior citizens. Anticipated increases in workloads, combined with the complexities inherent in the system, now threaten to overwhelm the ministry. Whenever a new tax is legislated, a completely new tax system must be put into place to administer it. Each tax system, or revision to a tax system, has so far involved new computer systems, labour-intensive and paper-bound business procedures, and new personnel. Problems abound. Over the next five years, the ministry

expects a 40 percent increase in workload to administer taxes and grants, and a 100 percent increase in workload for property assessments. Meanwhile, businesses and taxpayers are often confused because of the complexity of the tax system and the seeming mountain of paperwork with which they must contend. It is also very difficult for the ministry to compile a complete picture of any single taxpayer. As a result, the ministry estimates that it is losing 10 percent to 15 percent of tax revenues annually because of unintentional and intentional underpayment.

ESPRIT is comprised of nineteen initiatives aimed at re-engineering business methods and improving service delivery. Ministry staff are reviewing all program areas with a view to redesigning management and business processes. By redesigning business units, and taking advantage of new information technologies, the ministry hopes to enable employees to be more involved in decision making, and to create a more challenging and enriched working environment.

The ministry is also standardizing accounting practices and integrating all of the separate tax systems into a single taxroll. These actions will eliminate duplicate information, and allow clients to deal with the ministry through a single office. The integrated taxroll supports information-sharing among the branches, which in turn aids in coordinating audits and collections.

In addition, expert systems are being introduced to diffuse expertise among all of the ministry's staff. Electronic links are being set up to handle enquiries, disseminate information, and issue and receive payments.

The ESPRIT initiatives will ultimately increase effectiveness while providing clients with a comprehensive, yet simpler, access to the ministry. The payoff will be improved customer service despite ever-increasing workloads, an enriched job environment, increased compliance, and increased revenues in the form of previously uncollected taxes.

Automatic telephone answering and enquiry

The Ministry of the Attorney General has deployed sophisticated telecommunications technology to enhance service levels in its Support and Custody Orders Enforcement (SCOE) program. The ministry has installed a Voice Response Unit (VRU) that enables clients with touch-tone telephones to obtain information regarding their support-payment enquiries.

The SCOE program is responsible for monitoring and enforcing spouse and child support payments. Prior to installing the VRU, the program handled approximately 1,500 calls per day, and the average length of a call was about seven minutes. Upon analysis, the ministry discovered that 60 percent to 70 percent of these calls were regarding the status of support payments, and that some callers were on hold for as much as twenty minutes waiting for service. Since the installation of the VRU, the program has been handling approximately 5,000 calls per day with an average call length of thirty seconds. A further payoff of the system is that clients can now call, from anywhere in Ontario, in either French or English, and enquire about:

- payment information on their case;
- general information about SCOE;
- information on enforcement actions available;
- information on custody matters;
- addresses of field offices;
- instructions on how to change case information.

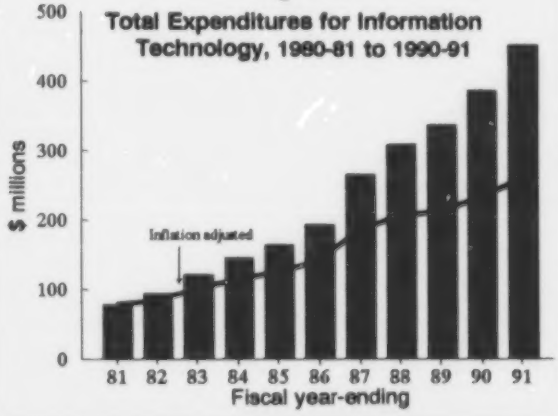
Program delivery has improved dramatically. Staff who once spent most of their time answering payment enquiries may now concentrate on enforcing delinquent cases.

EXPENDITURE TRENDS

Overall spending continues to rise

Overall government spending for information technology has grown from $266 million in 1986-87 to $387 million in 1989-90. The information technology budget reported by the ministries for 1990-91 is $454 million. However, indications to date are that actual total spending will be close to $475 million.

Figure 1



NOTE: * denotes estimate.

As the inflation-adjusted line in Figure 1 shows, there was a relatively large increase in information technology spending in the years 1986-87 and 1987-88. The rate of increase slowed over the next two years as ministries concentrated on the development of information technology strategic plans. Now that most of these plans have been completed and ministries are beginning to implement them, it is expected that there will be another relatively large increase in total information technology spending, as the projected 1990-91 levels appear to demonstrate.

Table 13 on page 18 in the appendix of this report provides a breakdown of what each ministry has spent on information technology in the years 1980-81 through 1990-91. Most ministries show minor fluctuations in their information technology budgets as these are adjusted to meet overall objectives and constraints.

Information technology is growing as a share of total costs

Over the five-year period from 1984-85 to 1989-90, information technology spending rose at an inflation-adjusted average annual rate of 12.6 percent. In the same period, total government operating costs (excluding information technology expenditures) rose at an inflation-adjusted average annual rate of only 0.8 percent. By 1990, information technology accounted for 6.5 percent of the government's total operating costs, compared to 3.8 percent of total costs five years earlier.

Most of this increased spending has been justified on the basis of cost savings and/or cost containment as well as improved service to the public. The low growth in overall operating costs over the past five years despite many new government programs and rapidly increasing transaction volumes is a reasonable indication that these benefits are being achieved.

The potential for further returns from investments in information technology exist. Experts suggest that over the next ten years, organizations will need to spend up to 10 percent or more of their operating budgets on information technology. Several ministries in the Ontario government have already reached or surpassed this expenditure level. At the current rates of growth, most ministries will have reached this level by 1994-95.

Changes in how the information technology dollar is spent

Throughout the seventies, the traditional allocation of the information technology dollar was almost constant: 25 percent for systems development; 15 percent for systems maintenance; and 60 percent for systems operations. In the eighties, as the scope of information technology broadened and the costs of technology dropped, the mix changed, as shown in Table 1 on page 10. The "systems operations" function includes expenditures on equipment, except for equipment directly attributable to development and maintenance. The "end-user computing and office automation" function includes expenditures on equipment specifically related to office systems, such as PCs and printers.

TABLE 1: PERCENTAGE ALLOCATION OF INFORMATION TECHNOLOGY SPENDING BY MAJOR FUNCTION, 1978-79 TO 1989-90

	Fiscal year ending			
	79*	85	87	90
Systems planning	–	–	2	6
Other infrastructure	–	2	3	5
Systems development	28	18	18	20
Systems maintenance	12	14	10	12
Systems operations	59	52	47	32
End-user computing and office automation	–	13	21	24
	100	100	100	100

NOTE: * denotes estimate

In Table 1, the most significant trend presented is a sharp percentage drop in spending on systems operations, resulting from:

- an increasing proportion of work being done on small economical machines, and a corresponding reduction in the growth of spending on expensive mainframe technology;
- declines in the unit prices of computer-equipment, service-bureaux, and telecommunications services, including a 61 percent overall reduction over the past five years in the charges of the Ministry of Government Services' Computer and Telecommunication Services (CTS) division;
- reductions in the number of data-entry personnel and use of data-entry services, arising from the replacement of batch systems by on-line systems.

Spending on "end-user computing and office automation," a function that includes information centres as well as personal computing and office-automation systems, is shown in Table 1 to account for one-quarter of the government's total information technology budget in 1990-91. The "systems planning" and "other infrastructure" functions accounted for 11 percent of total information technology expenditures in the Ontario government in the same year.

Distribution of expenses

A rise in spending on equipment is shown in Table 2. This increase is almost entirely due to a surge in the number of personal computers purchased for government offices. Between March 1987 and March 1990, the Ontario government bought 20,000 personal computers for use in its operations.

TABLE 2: PERCENTAGE DISTRIBUTION OF INFORMATION TECHNOLOGY SPENDING BY TYPE OF EXPENSE, 1983-84 TO 1989-90

	Fiscal year ending			
	84	86	88	90
Staffing	27	31	32	32
Consultants	10	9	12	13
Equipment	19	22	23	31
Software	1	2	3	5
Data communications	7	7	6	5
External service bureaux	7	6	5	2
Internal service bureau (CTS)	30	23	19	12
	100	100	100	100

Spending on software is also rising. This increase in spending is partly due to the tendency of equipment vendors to increase software revenue as hardware costs drop, and partly due to the growing number of personal computers purchased, most of which require off-the-shelf software.

Although there is evidence that data-communication traffic is increasing throughout the government, the relative cost of it has slightly declined. This decline is the result of price reductions by telecommunication suppliers, bulk-purchasing practices by the Ministry of Government Services, and some migration from external communications networks to local-area networks.

The most significant change in the distribution of information technology expenditures in recent years is the continued decline of the share that service bureaux represent. These include external computer-processing and data-entry service bureaux, as well as the government's internal service bureau, the CTS division of the Ministry of Government Services. As shown in Table 2,

spending on these external and internal suppliers represented 37 percent of overall information technology expenditures in 1983-84. By 1989-90, such spending had dropped to 14 percent of total expenditures. This drop is due to several factors:

- the economic advantages of shared-mainframe service-bureau processing have been diminished by the ready availability, low prices and strong performance of departmental minicomputers and high capacity personal computers;
- the cost of increasing transaction volumes has been offset by reductions in service-bureau charges, made possible by new high-end technology with superior price/performance ratios;
- the use of data-entry service bureaux has declined as batch systems are being replaced by on-line systems able to capture key information at the time that it is generated.

Equipment spending

Expenditures on computer equipment have increased more than any other type of information technology expense and are the largest single category of such expenses. As shown in Table 3, in 1983-84 such expenditures totalled $27 million. By 1989-90 they rose to $112 million. Outright purchases of equipment accounted for 65 percent of this total. Leasing and rental costs accounted for 20 percent, and equipment-maintenance costs for the remaining 15 percent of equipment expenditures.

TABLE 3: INFORMATION TECHNOLOGY EQUIPMENT EXPENSES, 1983-84 TO 1989-90 ($ million)

	Fiscal year ending			
	84	86	88	90
Mainframes	0.0	5.8	9.0	21.8
Minis	7.4	13.8	21.3	24.0
PCs	4.9	14.0	25.9	53.0
Other	15.2	8.4	13.4	13.5
Total	**27.5**	**42.0**	**69.6**	**112.4**

In 1989-90, the government spent $53 million on personal computers and associated local-area-network hardware. By March 1990, there were a total of 24,000 personal-computer workstations throughout the government, in addition to an estimated 12,000 mainframe and minicomputer terminals.

This rise in equipment expenditures, which also has occurred in the private sector, is partly the result of increased strategic planning designed to coordinate business initiatives and information technology spending. During the strategic-planning process, an organization identifies business opportunities for improving service delivery. These business opportunities are often contingent upon implementing modern, sophisticated computer systems, which in turn often demand increased spending on information technology.

TECHNOLOGY USAGE TRENDS

As rough gauges of the extent that ministries have invested in information technology, three usage indicators have been established:

- the number of employees per computer workstation;
- the amount of information technology spending per employee;
- information technology spending's percentage share of ministries' total operating costs.

Table 4 shows the progress of these indicators since they were first measured in 1984-85. In the mid-eighties, fewer than one in eleven government employees was working directly with computers. By 1990, there were four workstations for every ten employees. Over the next four years this ratio is expected to approach three workstations for every four employees, and thereafter gradually approach an ultimate level of nine workstations for every ten employees.

TABLE 4: TECHNOLOGY USAGE INDICATORS, 1984-85 TO 1989-90

	Fiscal year ending		
Indicator	85	87	90
Employees per workstation	11.3	7.4	2.5
Information tech. spending per employee ($000s)	$2.1	$3.2	$4.4
Information tech. budget to ministries' total	3.8%	5.2%	6.5%

Over the period from 1984-85 to 1989-90, all indicators in Table 4 point to an increase in the usage of information technology, although the rate of growth of spending on information technology has slowed since 1986-87.

Table 14 on page 19 of this report presents technology-usage data for each ministry in the Ontario government. Variations in technology-usage levels among ministries exist because of two factors: ministries are in different stages of information technology development; and ministries have different business needs that require different degrees of investment in information technology. For example, when comparing indicators based on the number of employees per workstation, it is important to remember that of the 88,000 permanent positions in the government, about 11,000 of these are not normally considered to be traditional white-collar jobs—positions such as firefighter, prison guard, certain health-care workers, roads-maintenance employee, parks employee, etc. Computer terminals are not always prevalent for these types of positions, and some ministries have many more types of these positions than others. Consequently, in some ministries indicators must be reviewed within this context.

However, it is evident that information technology is playing a significant role across the Ontario government. A number of ministries are already spending between 10 percent and 20 percent of their overall operating costs on information technology. As shown in Table 14 on page 19 of this report, several ministries have already reached a one-to-one ratio between workstations and employees.

PERSONNEL TRENDS

The number of personnel employed in information technology functions is measured in "person-year" equivalents, so that people only partly involved in information technology projects can be counted, as well as consultants who are engaged in specific projects for only limited periods.

Overall, the number of person-years dedicated to information technology functions rose from 2,401 in 1986-87 to 3,224 in 1989-90, an average rise of 13 percent per year which is in keeping with the overall rise in information technology spending.

Although the numbers have been increasing, the average cost per information technology person-year (in salaries and consultants' fees) has remained stable in constant-dollar terms. As shown in Table 12 on page 17 of this report, the average cost rose from $44,525 per person-year in 1986-87 to $52,365 in 1989-90, an increase slightly less than that for the rate of inflation in this period.

In 1982, the Management Board of Cabinet introduced government-wide guidelines concerning the number of information technology consultants that ministries should use relative to the number of their information technology employees. Each ministry was advised to limit the number of consultants to a maximum of one for every three employees (1:3 ratio). Over the next five years this ratio dropped slowly from 1:2.8 to a level of 1:3.8 by 1986-87.

Since 1986-87, consultants have been used widely to assist ministries in the development of their strategic plans and in launching other large projects. Although specific data was not available to determine the exact consultant-employee ratio in 1989-90, expenditure data indicates that the ratio has increased during this period.

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NOTES: All figures for fiscal year 1990-91 are estimates.

Many figures have been rounded and hence may not add up exactly to the totals shown.

Expenditure categories

The following types of expenditures can be found in the appendix tables.

- *Systems planning*—includes the cost of strategic and other high-level planning; does not include the cost of planning specific applications, an activity which is part of systems development.
- *Systems development*—encompasses all hardware, software, personnel and telecommunication costs attributable to the development of application systems; does not include the costs of developing office-automation systems.
- *Systems maintenance*—covers all of the costs associated with maintaining a production system.
- *Systems operations*—incorporates all of the costs of operating a production system.
- *End-user computing and office automation (end-user and OA)*—includes the costs of all personal-computer equipment, information-centre costs, office-automation support, and the costs of developing and operating office systems.
- *Infrastructure*—includes the cost of specialized functions such as administration and security that cannot be attributed to any of the above categories.

Computer and Telecommunication Services (CTS)

Ministry expenditures paid to the Computer and Telecommunication Services Division (CTS) of the Ministry of Government Services are included in the "internal (information technology) services" category. To avoid double-counting, CTS expenditures are not in turn included as part of the expenditures of the Ministry of Government Services. CTS expenditures are not noted separately in the appendix, except as part of Table 10.

TABLE 5: INFORMATION TECHNOLOGY EXPENDITURES, ONTARIO GOVERNMENT, 1978–91 (Inflation-adjusted, $ millions)

	Fiscal year ending												
	79*	80*	81*	82*	83*	84	85	86	87	88	89	90	91*
Systems planning	–	–	–	–	–	–	–	3.2	4.7	6.5	–	25.2	–
Other infrastructure	–	–	–	–	–	3.7	5.2	9.0	10.6	16.4	–	28.6	–
Systems development	35.8	28.8	34.1	41.0	57.1	36.7	37.1	41.8	55.7	76.1	–	76.2	–
Systems maintenance	15.3	17.9	20.4	23.6	25.9	31.0	30.3	27.8	29.6	30.8	–	49.6	–
Systems operations	75.1	89.3	77.3	77.8	87.1	102.5	110.3	113.8	145.6	153.5	–	113.0	–
End-user & OA	–	–	–	–	–	20.0	27.4	41.2	63.7	61.6	–	94.3	–
Total	**126.2**	**136.0**	**131.7**	**142.3**	**170.1**	**193.9**	**210.2**	**236.8**	**309.9**	**345.0**	**356.3**	**386.9**	**449.4**

NOTES: Inflation adjustments have been made using 1990 as the base year and with reference to the Ontario Consumer Price Index.
* denotes estimate.

TABLE 6: PERCENTAGE GROWTH RATES OF INFORMATION TECHNOLOGY EXPENDITURES, ONTARIO GOVERNMENT, 1979–91 (Inflation-adjusted)

	Fiscal year ending											
	80*	81*	82*	83*	84	85	86	87	88	89	90	91*
Systems planning	–	–	–	–	–	–	–	46	39	78	116	–
Other infrastructure	–	–	–	–	–	41	72	18	54	26	39	–
Systems development	–20	18	20	39	–36	1	13	33	37	–	–	–
Systems maintenance	17	14	16	10	20	–2	–8	6	4	21	32	–
Systems operations	19	–13	1	12	18	8	3	28	5	–11	–17	–
End-user & OA	–	–	–	–	–	37	50	55	–3	19	28	–
Total	**8**	**–3**	**8**	**20**	**14**	**9**	**13**	**31**	**11**	**3**	**9**	**13**

NOTES: Inflation adjustments have been made using 1990 as the base year and with reference to the Ontario Consumer Price Index.
* denotes estimate.

TABLE 7: INFORMATION TECHNOLOGY SPENDING BY TYPE OF EXPENDITURE, ONTARIO GOVERNMENT, 1983-90 ($ thousands)

	Fiscal year ending						
	84	85	86	87	88	89	90
Salaries	38,807	44,985	60,482	75,406	98,676	–	118,252
Consultants	14,374	13,119	17,688	24,529	35,554	–	50,573
Equipment	27,467	35,873	41,985	78,751	69,593	–	112,419
Software	1,393	3,100	3,454	6,970	9,756	–	17,718
Data communications	10,433	14,580	13,672	19,504	19,472	–	18,805
External services	10,424	8,999	10,845	12,490	15,648	–	8,887
Internal services	43,178	44,669	45,477	48,063	59,975	–	45,069
Other	–	–	–	–	–	–	15,241
Total	**146,076**	**165,325**	**193,603**	**265,713**	**308,673**	**337,407**	**386,964**

TABLE 8: PERCENTAGE DISTRIBUTION OF INFORMATION TECHNOLOGY SPENDING BY TYPE OF EXPENDITURE, ONTARIO GOVERNMENT, 1983–90

	Fiscal year ending						
	84	85	86	87	88	89	90
Staffing	27	27	31	28	32	–	31
Consultants	10	8	9	9	12	–	13
Equipment	19	22	22	30	23	–	29
Software	1	2	2	3	3	–	5
Data communications	7	9	7	7	6	–	5
External services	7	5	6	5	5	–	2
Internal services	30	27	23	18	19	–	12
Other	–	–	–	–	–	–	4
	100	100	100	100	100	–	100

TABLE 9: INFORMATION TECHNOLOGY EQUIPMENT EXPENDITURES, ONTARIO GOVERNMENT, EXCLUDING CTS, 1983–90 ($ thousands)

	Fiscal year ending						
	84	85	86	87	88	89	90
Mainframes	–	–	5,815	14,120	9,029	–	21,807
Minis	7,365	8,689	13,770	22,492	21,298	–	24,007
PCs	4,896	9,689	13,959	29,419	25,915	–	53,030
Other	15,206	17,495	8,441	12,720	13,351	–	13,576
Total	27,467	35,873	41,985	78,751	69,593	–	112,420

TABLE 10: INFORMATION TECHNOLOGY EQUIPMENT EXPENDITURES, ONTARIO GOVERNMENT, INCLUDING CTS, 1983–90 ($ thousands)

	Fiscal year ending						
	84	85	86	87	88	89	90
Mainframes	20,817	23,225	30,972	33,363	28,173	–	43,084
Minis	7,365	8,689	13,770	22,492	21,298	–	24,007
PCs	4,896	9,689	13,959	29,419	25,915	–	53,233
Other	16,578	18,850	10,392	15,167	13,351	–	13,576
Total	49,656	60,453	69,093	100,441	88,737	–	133,900

TABLE 11: NUMBER OF PERSON-YEARS IN INFORMATION TECHNOLOGY FUNCTIONS, ONTARIO GOVERNMENT, 1983–90

	Fiscal year ending					
	84	85	86	87	88/89	90
Systems planning	–	–	81	116	–	259
Other infrastructure	47	61	31	113	–	348
Systems development	451	458	490	663	–	741
Systems maintenance	433	439	437	457	–	511
Systems operations	442	456	684	780	–	709
End-user & OA	124	142	191	272	–	656
Total	1,497	1,556	1,914	2,401	–	3,224

TABLE 12: AVERAGE STAFFING COSTS, ONTARIO GOVERNMENT, 1983–90 ($ thousands)

	Fiscal year ending					
	84	85	86	87	88/89	90
Salaries & consultants	54,574	61,204	81,623	106,905	–	168,824
Average cost/person-year	36,456	39,334	42,645	44,525	–	52,365
Inflation-adjusted to 1990	48,354	50,028	52,151	51,925	–	52,365

NOTE: Inflation adjustments have been made using 1990 as the base year and with reference to the Ontario Consumer Price Index.

TABLE 13: INFORMATION TECHNOLOGY EXPENDITURES BY MINISTRY, 1980–91 ($ thousands)

	Fiscal year ending										
	81*	82*	83*	84	85	86	87	88	89	90	91*
Agriculture & Food	971	1,250	1,767	3,813	4,970	5,323	8,487	10,035	11,150	12,389	21,427
Attorney General	3,989	3,659	5,759	5,380	6,260	5,364	12,222	24,570	25,934	27,412	27,828
Cabinet & Premier's Office	–	–	–	–	–	87	420	427	565	702	756
Colleges & Universities	–	–	–	–	–	245	2,302	2,295	2,555	2,816	2,352
Community & Soc. Servs.	4,627	7,604	9,195	11,843	13,129	19,002	21,880	33,566	34,357	32,869	34,011
Consumer & Comm. Rels.	3,619	4,818	5,733	6,297	8,483	6,081	8,717	12,000	16,500	21,727	28,010
Correctional Services	831	1,311	1,683	2,691	2,709	4,187	6,997	8,600	11,134	15,755	16,376
Culture & Communications	1,087	1,013	776	628	803	1,735	1,564	4,169	1,357	1,583	3,900
Education	4,805	5,245	5,461	6,112	7,273	9,837	16,921	8,300	10,700	12,600	14,400
Energy	–	–	45	259	550	877	1,100	709	864	843	902
Environment	1,356	1,628	2,781	3,864	4,489	6,313	10,051	12,469	14,748	16,206	16,647
Financial Institutions	–	–	–	–	–	–	561	873	3,784	3,994	7,009
Govt. Services (excl. CTS)	6,177	7,312	11,100	11,442	10,351	10,267	9,946	17,392	20,826	21,843	24,227
Health	13,123	12,484	13,563	14,578	16,094	18,175	26,589	25,113	34,182	49,908	75,575
Housing	6,523	6,450	8,738	9,579	10,175	11,168	12,093	10,705	12,485	14,324	16,452
Industry, Trade & Tech.	499	1,538	818	2,240	2,848	2,558	3,181	4,710	2,756	5,134	7,268
Intergovernmental Affairs	–	1,472	–	95	50	18	104	46	494	265	247
Labour	886	1,112	1,485	2,449	2,589	2,687	7,730	6,242	8,046	10,384	8,256
Management Board/HRS	540	579	1,053	729	2,251	1,874	2,015	3,603	4,144	4,345	4,769
Municipal Affairs	–	–	–	–	–	2,535	3,267	4,480	4,367	5,261	3,872
Natural Resources	3,699	3,759	3,965	7,582	8,289	11,949	21,068	11,848	17,414	19,314	21,160
Northern Dev. & Mines	–	30	–	337	370	1,562	3,710	4,230	3,678	3,126	2,354
Revenue	9,548	15,775	19,811	18,348	20,031	23,316	23,861	38,372	28,483	32,650	37,738
Skills Development	–	–	–	–	–	1,778	3,159	5,147	3,431	3,960	4,443
Solicitor General	2,884	3,897	5,240	4,862	5,892	7,387	10,228	9,543	14,817	17,561	17,100
Tourism & Recreation	–	–	–	1,335	1,715	1,303	1,550	3,364	2,836	4,475	3,943
Transportation	10,305	10,879	20,257	28,860	32,962	34,162	42,218	41,800	41,800	41,661	48,800
Treasury & Economics	3,486	2,955	2,944	2,754	3,043	3,813	3,775	4,065	4,000	3,860	4,200
All ministries	78,955	94,770	122,174	146,077	165,326	193,603	265,716	308,673	337,407	386,964	454,023
Inflation-adjusted	**131,810**	**142,273**	**170,085**	**193,753**	**210,272**	**236,751**	**309,874**	**344,971**	**356,300**	**386,964**	**429,539**
Percentage growth		20.0%	28.9%	19.6%	13.2%	17.1%	37.2%	16.2%	9.3%	14.7%	17.3%
Five-year compound growth						19.6%	22.9%	20.4%	18.2%	18.5%	18.6%
Inflation-adjusted growth		7.9%	19.5%	13.9%	8.5%	12.6%	30.9%	11.3%	3.3%	8.6%	12.7%

NOTES: Inflation adjustments have been made using 1990 as the base year and with reference to the Ontario Consumer Price Index.

* denotes estimate.

TABLE 14: TECHNOLOGY USAGE INDICATORS BY MINISTRY, 1984–90

	Info tech spending ($ thousands)	Spending as % of ministry total			Spending per employee ($)			Employees per workstation		
	89-90	84-85	87-88	89-90	84-85	87-88	89-90	84-85	87-88	89-90
Health	49,908	3.8	4.9	7.3	1,319	2,093	3,864	19.0	8.5	8.8
Transportation	41,661	5.1	5.5	6.4	3,354	4,348	4,319	7.1	7.8	2.9
Community & Soc. Servs.	32,869	3.4	4.9	6.2	1,186	1,960	3,120	35.5	25.8	3.3
Revenue	32,650	11.8	12.5	13.9	4,917	5,811	7,843	4.1	2.7	1.3
Attorney General	27,412	3.1	4.8	7.8	1,183	2,223	4,219	32.7	16.9	2.6
Govt. Services (excl. CTS)	21,843	3.0	2.4	3.8	3,478	3,082	8,230	11.1	14.5	1.4
Consumer & Comm. Rels.	21,727	9.3	9.5	17.2	3,280	3,675	8,286	6.9	3.4	2.1
Natural Resources	19,314	2.2	4.4	3.6	1,558	3,743	3,367	13.2	7.4	1.9
Solicitor General	17,561	1.9	2.8	3.6	894	1,514	2,534	25.5	15.3	4.6
Environment	16,206	2.8	4.7	6.0	1,941	3,923	5,482	20.1	6.7	1.6
Correctional Services	15,755	1.2	2.1	3.3	444	987	1,946	18.6	15.6	4.1
Housing	14,324	15.2	29.2	17.9	7,845	9,485	10,166	3.2	1.6	0.9
Education	12,600	5.4	12.7	8.7	2,482	7,383	4,746	11.9	5.9	2.3
Agriculture & Food	12,389	4.8	6.6	7.6	2,421	3,731	5,256	6.0	6.7	1.4
Labour	10,384	3.7	8.2	8.3	1,646	4,453	5,709	12.1	4.7	1.6
Municipal Affairs	5,261	–	–	19.2	–	5,908	9,653	–	3.3	1.2
Industry, Trade & Tech.	5,134	4.3	4.9	6.4	4,146	4,224	7,082	5.1	2.7	1.1
Tourism & Recreation	4,475	3.5	2.4	5.4	2,389	1,652	6,791	14.1	10.3	1.3
Management Board/HRS	4,345	1.3	1.0	7.4	6,740	4,730	4,812	2.4	1.8	1.5
Financial Institutions	3,994	–	25.4	9.9	–	15,250	5,147	–	17.5	1.4
Skills Development	3,960	–	8.3	8.9	–	5,671	6,387	–	5.0	1.7
Treasury & Economics	3,860	1.3	6.0	5.4	6,688	8,738	9,039	2.0	1.6	0.8
Northern Dev. & Mines	3,126	0.4	3.1	5.5	1,667	5,346	3,798	11.7	4.9	1.6
Colleges & Universities	2,816	–	29.8	16.5	–	8,622	7,611	–	1.6	1.5
Culture & Communications	1,583	2.4	3.8	2.5	982	1,573	1,918	21.0	9.9	5.1
Energy	843	1.4	3.3	3.8	2,148	4,846	3,279	7.5	10.3	1.0
Cabinet & Premier's Office	702	–	–	6.8	–	–	4,946	–	–	1.2
Intergovernmental Affairs	265	0.7	1.7	3.6	562	1,368	3,442	4.5	5.8	0.8
All ministries	**386,964**									
Ministry average		3.8%	5.3%	6.5%	2,072	3,193	4,423	11.3	7.4	2.5

TABLE 15: MINISTRY INFORMATION TECHNOLOGY SPENDING BY TYPE OF EXPENDITURE, 1989-90 ($ thousands)

	Salaries	Consultants	Equipment	Software	Data comm.	Service Bureaux	Other	Total
Health	11,488	9,502	14,810	1,639	1,004	7,086	4,378	49,908
Transportation	10,776	2,911	11,325	1,569	4,462	9,630	988	41,661
Community & Soc. Servs.	12,828	2,260	10,829	1,361	197	4,809	585	32,869
Revenue	13,334	1,884	10,949	561	3,573	1,210	1,140	32,650
Attorney General	4,206	4,131	7,362	1,242	1,079	9,101	292	27,412
Govt. Servs. (excl. CTS)	7,014	5,650	3,742	1,369	19	3,264	785	21,843
Consumer & Comm. Rels.	9,654	1,470	6,000	1,356	333	2,914	–	21,727
Natural Resources	6,828	1,576	6,935	1,205	1,564	398	809	19,314
Solicitor General	5,882	–	6,606	481	2,425	528	1,639	17,561
Environment	3,897	2,573	6,296	1,342	798	1,300	–	16,206
Correctional Services	3,911	3,982	2,279	279	826	4,090	388	15,755
Housing	4,537	2,429	3,173	401	621	2,050	1,113	14,324
Education	7,158	980	1,689	304	140	1,668	661	12,600
Agriculture & Food	2,372	3,544	2,402	1,681	271	2,015	105	12,389
Labour	3,104	1,789	3,802	730	118	316	525	10,384
Municipal Affairs	1,342	1,276	1,769	292	51	255	276	5,261
Industry, Trade & Tech.	1,184	1,168	2,301	266	113	102	–	5,134
Tourism & Recreation	803	568	2,045	535	76	46	403	4,475
Management Board/HRS	1,926	510	1,262	133	77	436	–	4,345
Financial Institutions	758	831	1,109	123	667	464	42	3,994
Skills Development	464	435	1,390	205	65	1,010	391	3,960
Treasury & Economics	1,300	219	1,380	122	23	652	163	3,860
Northern Dev. & Mines	1,194	388	1,067	42	266	116	53	3,126
Colleges & Universities	1,470	58	341	201	–	746	–	2,816
Culture & Communications	452	300	490	180	10	150	–	1,583
Energy	338	30	387	41	1	–	45	843
Cabinet & Premier's Office	–	58	556	32	–	36	21	702
Intergovernmental Affairs	32	53	123	27	27	–	5	265
All ministries	118,251	50,573	112,419	17,718	18,805	53,956	15,241	**386,964**
Percentage of total govt.-wide expenditure	31%	13%	29%	5%	5%	14%	4%	100%

TABLE 16: MINISTRY INFORMATION TECHNOLOGY SPENDING BY FUNCTION, 1989-90 ($ thousands)

	Systems planning	Sys. dev.	Sys. maint.	Sys. ops.	End-user & OA	Info tech Infra-structure	Total
Agriculture & Food	1,279	3,716	3,098	1,199	1,561	1,536	12,389
Attorney General	1,778	4,374	5,148	11,119	4,993	–	27,412
Cabinet & Premier's Office	–	–	–	–	702	–	702
Colleges & Universities	89	785	504	862	499	78	2,816
Community & Soc. Servs.	2,315	7,579	1,604	6,088	12,883	2,399	32,869
Consumer & Comm. Rels.	500	10,921	1,500	8,306	500	–	21,727
Correctional Services	100	3,930	1,575	5,900	1,200	3,050	15,755
Culture & Communications	240	300	150	320	70	502	1,583
Education	633	3,876	4,924	1,597	660	911	12,600
Energy	25	30	17	–	771	–	843
Environment	117	5,516	1,605	2,098	6,871	–	16,206
Financial Institutions	72	1,723	25	54	2,080	40	3,994
Govt. Servs. (excl. CTS)	703	8,102	6,247	3,046	3,036	710	21,843
Health	865	4,621	3,077	12,654	17,845	10,846	49,908
Housing	842	1,097	3,745	5,375	3,264	–	14,324
Industry, Trade & Tech.	190	978	716	225	3,024	–	5,134
Intergovernmental Affairs	–	–	–	–	265	–	265
Labour	1,041	2,074	3,888	902	1,375	1,104	10,384
Management Board/HRS	1,351	174	178	134	2,085	422	4,345
Municipal Affairs	473	1,210	684	1,368	1,420	105	5,261
Natural Resources	1,335	4,184	2,505	5,694	4,416	1,181	19,314
Northern Dev. & Mines	78	1,648	66	1,159	174	–	3,126
Revenue	8,285	2,593	1,276	17,468	1,276	1,751	32,650
Skills Development	180	899	913	68	1,785	115	3,960
Solicitor General	140	2,412	127	7,702	5,449	1,730	17,561
Tourism & Recreation	306	114	215	1,058	2,783	–	4,475
Transportation	2,083	2,916	4,999	17,915	11,665	2,083	41,661
Treasury & Economics	205	439	841	669	1,624	82	3,860
All ministries	25,224	76,212	49,627	112,982	94,276	28,644	**386,964**
Percentage of total govt.-wide expenditures	7%	20%	13%	29%	24%	7%	100%

TABLE 17: COMPUTER EQUIPMENT INVENTORY BY MINISTRY, 1989-90

	Computers		Workstations					
	Main-frames	Mini-computers	Stand-alone PCs	Net-worked PCs	Main-frame terminals	Other mini-terminals	Other work-stations	Total work-stations
Agriculture & Food	–	–	1,005	473	183	–	–	1,661
Attorney General	–	10	1,171	379	863	40	–	2,453
Cabinet & Premier's Office	–	–	–	120	–	–	–	120
Colleges & Universities	–	–	184	56	–	–	1	241
Community & Soc. Servs.	–	34	1,539	398	390	819	–	3,146
Consumer & Comm. Rels.	–	13	323	443	368	104	–	1,238
Correctional Services	1	10	600	250	820	320	–	1,990
Culture & Communications	–	3	50	70	3	40	–	163
Education	–	7	675	367	25	104	2	1,173
Energy	–	–	10	253	–	–	–	263
Environment	–	20	500	1,000	300	100	–	1,900
Financial Institutions	–	3	214	330	14	2	–	555
Govt. Servs. (excl. CTS)	–	8	1,120	213	326	115	84	1,858
CTS Division	4	2	232	20	151	–	–	403
Health	–	19	100	400	510	450	–	1,460
Housing	1	–	458	942	121	–	–	1,521
Industry, Trade & Tech.	–	3	240	395	–	37	–	672
Intergovernmental Affairs	–	–	76	20	–	–	–	96
Labour	–	16	470	227	–	453	12	1,162
Management Board/HRS	–	3	150	230	1	8	14	403
Municipal Affairs	–	3	75	350	10	15	–	450
Natural Resources	–	72	996	735	10	1,269	19	3,029
Northern Dev. & Mines	–	20	200	100	–	200	5	505
Revenue	1	2	710	1,015	1,270	4	97	3,096
Skills Development	–	2	180	122	6	65	–	373
Solicitor General	1	1	581	916	5	9	–	1,511
Tourism & Recreation	–	5	343	100	3	54	–	500
Transportation	–	4	975	587	1,740	31	–	3,333
Treasury & Economics	–	3	58	375	18	70	5	526
All ministries	**8**	**263**	**13,235**	**10,886**	**7,137**	**4,309**	**239**	**35,801**